RemoteDial

RemoteDial

Content

RemoteDial

1. Discription

The RemoteDial is an infrared remote control with rotary encoder input and learning capabilities.

Highlights:

- Compact size at 65 x 40.6mm
- Few components
- Easy mounting via rotary encoder shaft
- Learning capabilities
- Wide choice of encoders (Alps, Elma, ...)
- 6 Remote functions (dial right, dial left, short press, long press, pressed dial left, pressed dial right)
- Powered by CR2032 button cell, or 2xAA or AAA
- Quiescent current consumption: 3-9µA !!!
- 30 months battery lifetime (with CR2032)
- Good range

2. Operation

On power up, the remote will check if infrared data are stored. If not, default parameters are loaded. This process is signalled by LED2 blinking.
LED2 then lights up continuously. The UART interface is now active for 10 seconds to allow special parameter adjustments (see Chapter 2.). If no entry is made at the UART interface within this time, the microcontroller is switched to power saving mode, and LED2 is switched off. With every user input via the rotary encoder, the microcontroller wakes up, the LED2 is switched on, corresponding infrared signals are sent and the microcontroller goes back to sleep.

3. Battery life

The battery life depends mostly on how often remote signals are sent when the current consumption increases by a factor of >200. The specified battery life refers to the sleep mode only using CR2032. Extended lifetime can be had by using 2x AA or AAA batteries in series.

Bei Drehung wacht der Controller erst bei der zweiten Rastung auf

4. Teach mode

With the encoder button pressed, switch on power. LED2 flashes 3 times. The button can then be released. The master remote is positioned in front of the RemoteDial and the functions are taught sequentially as listed below. Successful learning is indicated by a one-off LED2 flashing. Only when all commands are learned will the parameters be permanently stored in the flash of the microcontroller. This is acknowledged by 4-time blinking of LED2. Cancellation is possible at any time by pressing the button again and is confirmed by the LED2 flashing 5 times.

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Teach order:

1. encoder anticlockwise *
2. encoder clockwise *
3. pressed encoder anticlockwise *
4. pressed encoder clockwise *
5. short press
6. long press

* refers to Alps Encoder (see parts list). Direction may be different for other encoder types

⚠️ In teach mode, the IR receiver is powered continuously and the controller is in standard mode. Power
consumption is thus high. It is recommended to either complete the teach mode, or to abort.

5. Hardware Versions

PCBv2 changes:

- Jumper (J0) to disconnect the battery
- Diode (D1) as polarity reverse protection
- Change Pull Up Resistors R8,9 SMD types

## 6. Assembly plan / assembly
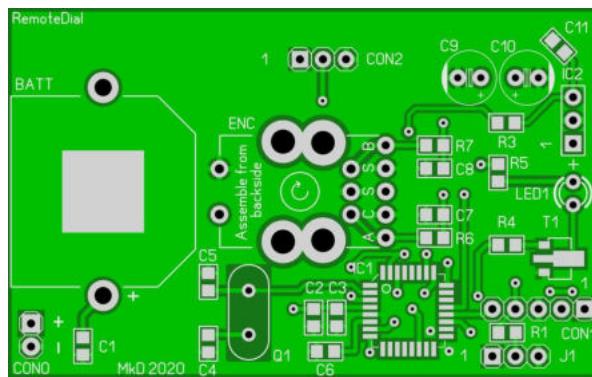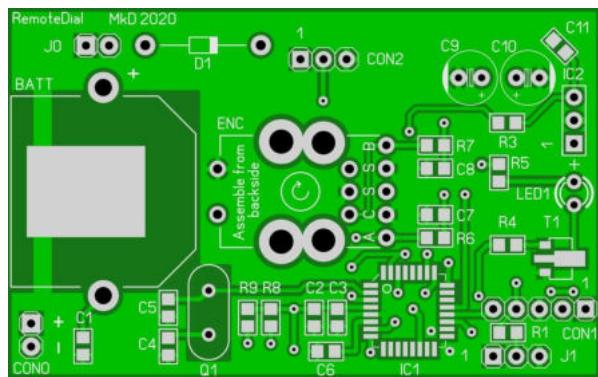
PCB v1   PCB v2

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- Deposit extra solder on the minus battery pad to ensure proper contact. The clip housing should not
  be touching the PCB.

- Some components are optional and not used (see parts list).

- No reverse power protection is included. Make sure that the polarity is correct.

- Note that the long lead of the IR transmitter is the cathode and the shorter lead the Anode, the latter marked as + on the PCB.
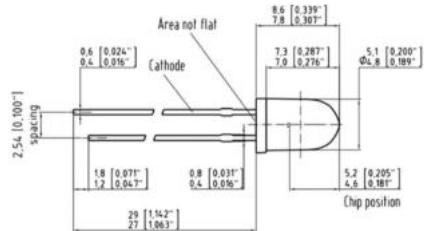
Dimensions in mm (inch). / Maße in mm (inch).

- Two 1M resistors has to be included (only PCB v1 !) to pull up of the encoder data lines in the power saving mode.

2x 1-1,5MOhm

6.1 Wiring diagram

Boot Jumper
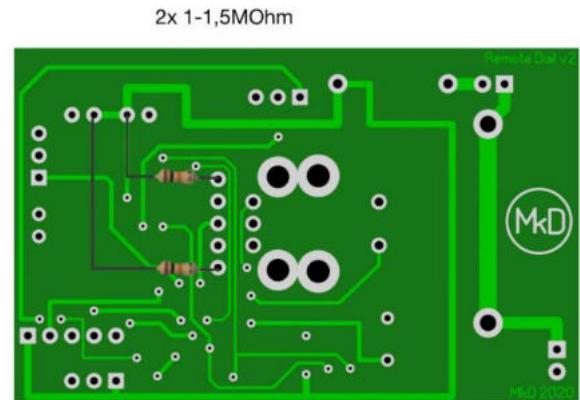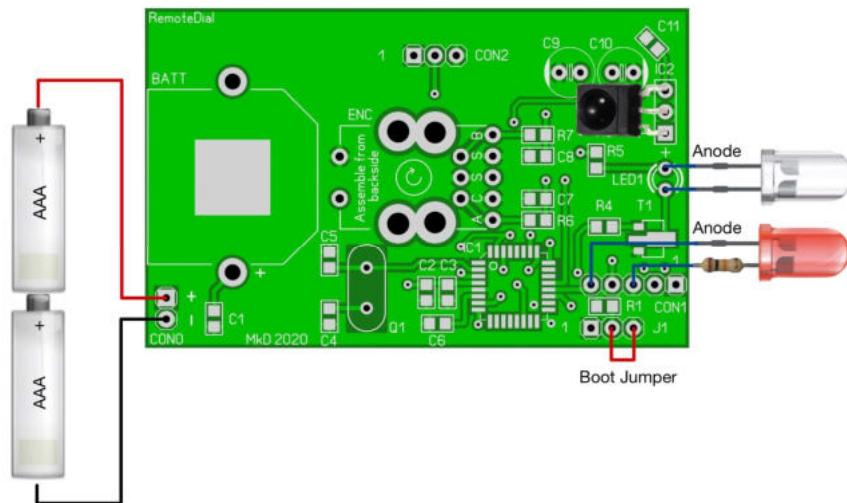
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As an alternative to the CR2032 battery, 2 AAA batteries in series, e.g., can be used. No voltage regulator is provided, so the supply voltage must be between 2 - 3.6V.

The status LED2 is optional and must be connected with a series resistor.

The Power jumper J0 (PCB v2) and the boot jumper on J1 (as shown) must be set.

6.2 Assembled PCB

Prototype picture

6.3 Dimensions
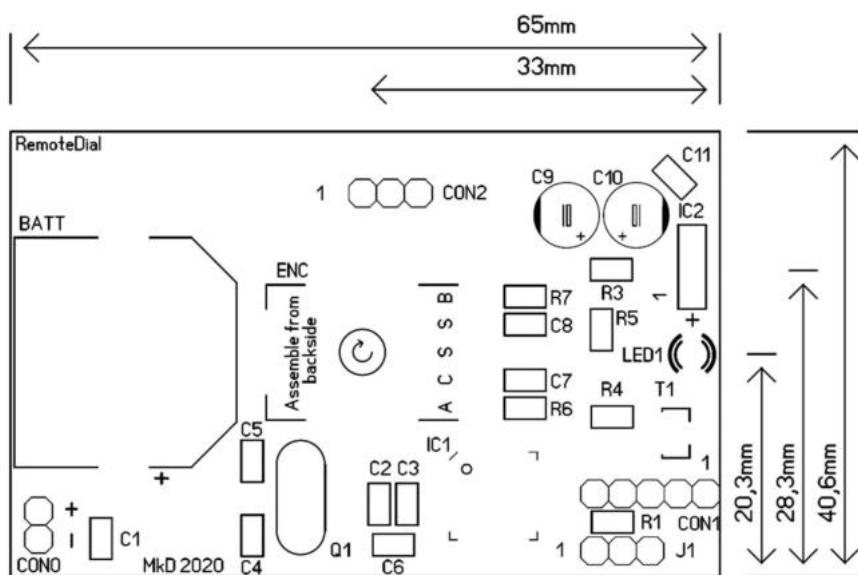
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7. Shematic
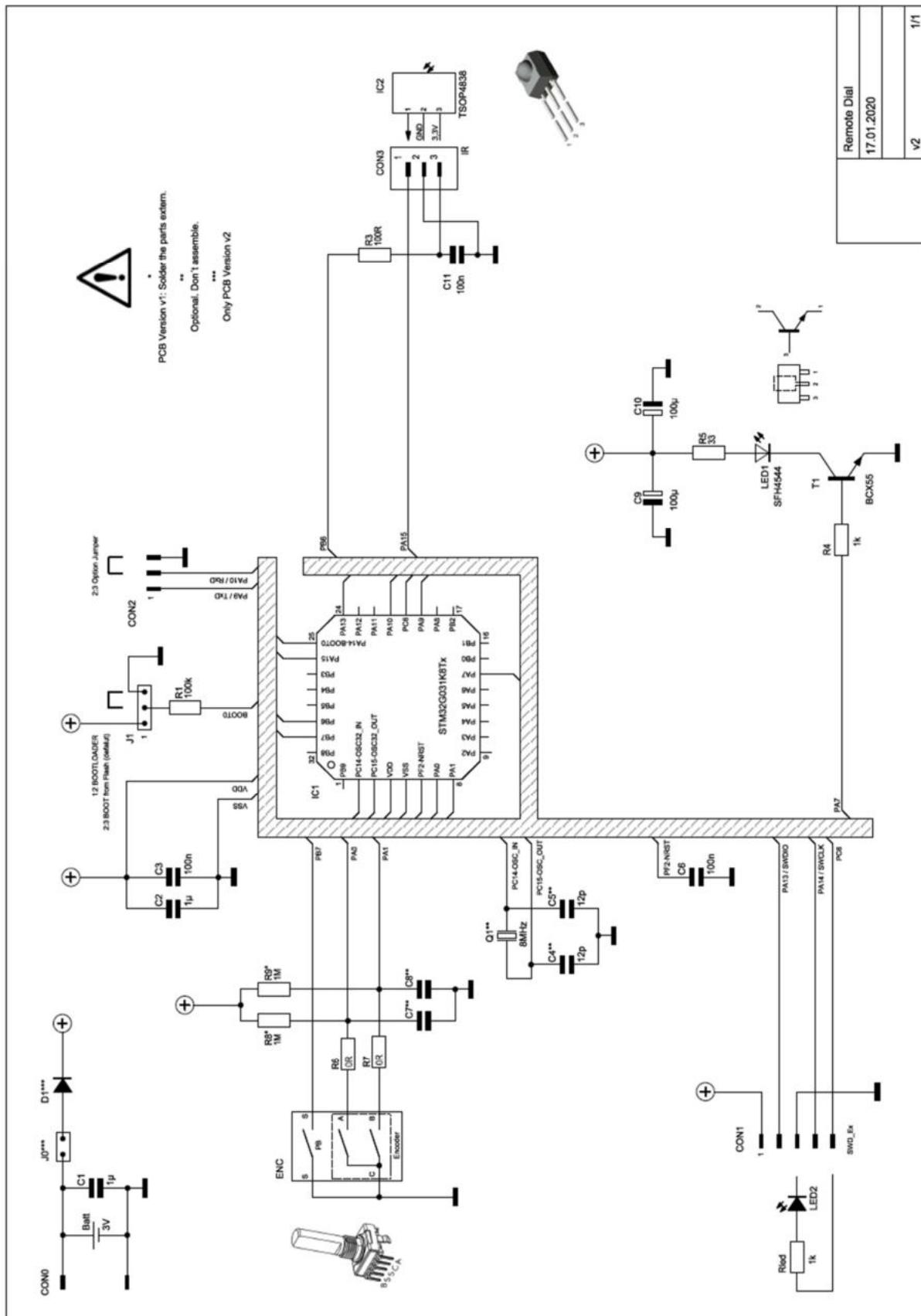
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8. Bill of materials

Resistors:

Component	Qty.	Value/Description	Comment	Vendor	Part No.
R1	1	100k	0805 SMD Resistor	Reichelt	SMD-0805 100K
R3	1	100R	0805 SMD Resistor	Reichelt	SMD-0805 100
R4	1	1k	0805 SMD Resistor	Reichelt	SMD-0805 1,00K
R5	1	33R	0805 SMD Resistor	Reichelt	SMD-0805 33
R6,7	2	0R	0805 SMD Resistor	Reichelt	SMD-0805 0,00
R8,9*	2	1M	0,25W thru hole Resistor	Reichelt	Metall 1,00M
R8,9**	2	1M	0805 SMD Resistor		
Rled	1	1k	0,25W thru-hole Resistor	Reichelt	Metall 1,00K

Capacitors:

Component	Qty.	Value/Description	Comment	Vendor	Part No.
C1,2	2	1µ	SMD 0805	Reichelt	KEM X7R0805A1,0U
C3,6,11	6	100n	SMD 0805	Reichelt	X7R-G0805 100N
C9,10	2	100µ/6,3V	RM2-2,5mm; dmax= 6mm	Reichelt	KA-A 100U 6,3
C4,5	0	12p	SMD 0805 / optional	Mouser	80-C0805X120J5GAUTO
C7,8	0	22n	SMD 0805 / optional	Reichelt	X7R 0805 CG 22N

Semiconductors:

Component	Qty.	Value/Description	Comment	Vendor	Part No.
D1**	1	1N5817	Shottkydiode 20V,1A, DO41	Reichelt	1N 5817
IC1	1	STM32G031K8Tx	Programmed STM32 Mikrocontroller	Groupbuy	
IC2	1	TSOP4838	IR Receiver	Reichelt	TSOP 4838
T1	1	BCX55	NPN, 60V, 1A, 1,3W, SOT-89	Reichelt	BCX 55 SMD
LED1	1	950nm	IR LED 950 nm 5 mm	Reichelt	SFH 4544 OSO
LED2	1	2mA	3mm green LED optional + 1k Resistor	Reichelt	LED 3MM 2MA GN

Others:

Component	Qty.	Value/Description	Comment	Vendor	Part No.
Gehäuse	1	AKG-69-24-80-SA	Case Fischer Elektronik 69x80x24mm black	https://www.tme.eu/de/	AKG-69-24-80-SA
Batteriehalter	1	Knopfzellenclip	Battery holder for Ø 20 mm	Reichelt	KZH 20P
Batterie	1	CR2032	Lithium-Battery, 3 V, 210mAh, 20,0x3,2 mm	Reichelt	CR 2032
Enc	1	Encoder	Elma Rotary Encoder, 16/32, with Pus Button	Bürklin	E33-VT612-M01T
Enc	0	Encoder	alternative Alps Rotary Encoder 15/30 with Push Button	Reichelt	STEC11B03
J0**,J1	2	Jumper	2,54mm	Reichelt	JUMPER 2,54 SW
CON0,CON1,CON2, J0**,J1	1	CON0,1,2,J1	Pin Strip 20pol. RM2,54	Reichelt	SL 1X36G 2,54
Q1	0	8MHz	optional	Reichelt	8,0000-HC49-SMD
	1	für CON1	Crimp Socket, 1x 5 -polig, female	Reichelt	PSK 254/5W
	1	für CON1	Contacts	Reichelt	PSK-KONTAKTE

* PCB v1 / ** PCB v2

9. UART Interface

The configuration is via a UART TTL Interface. This interface is active for 10 seconds after Power ON. A commercial USB Serial-TTL adaptor is required for the configuration. A converter with FTDI chip is recommended.

The following interface parameters must be set at the PC side :

9600Baud / 8 Data Bit / 1 Stop Bit / Parity None

After switching on the control, the controller sends the following data in ASCII format.

```
Remote Dial v0.0 20200130 MkD<\n>
Control with protocol STX + CMD + LEN + VALUEx + VALUEy + ETX<\n>
Debug Out Enable: STX + 'A' + '5' + '1' + ETX<\n>
Debug Out Disable: STX + 'A' + '5' + '1' + ETX<\n>
Set Default: STX + 'B' + '5' + '1' + ETX<\n>
Set Volume Repeat Value ('0'..'5'):  STX + 'C' + '5' + 'value' + ETX<\n>
<\n>
<\n>
Have fun :)))))))))))))) <\n>
```

9.1 Connection
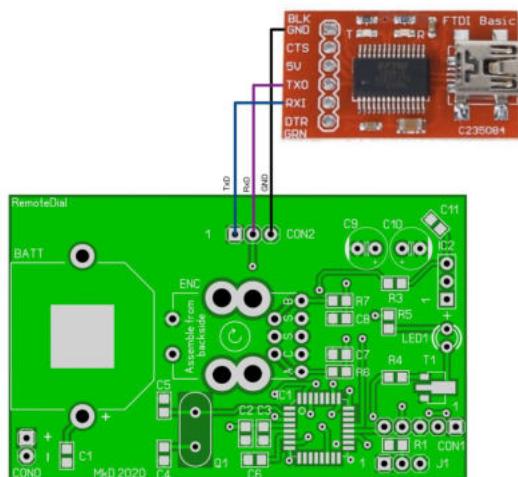
Here with an example FTDI USB-Serial adapter. In principle, every adapter is compatible with 3.3V TTL levels. TxD and RxD are crossed.

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9.2 Protocol Structure

Start STX, Command (CMD), Protocol length (LEN), Value 1. character (VALUE)...Value last character (VALUEn), Stop ETX

STX	CMD	LEN	VALUE1	…	VALUEn	ETX

Example (volume repetition = 3):

0x02	0x43	0x35	0x33	0x03
STX	(char = ‚C')	(char = ‚5')	(char = ‚3')	ETX

The command (CMD) can be found in the following table, it corresponds to the characters 'A' - 'Z'.

LEN corresponds to the length of the sent data in bytes (incl. STX / ETX).

The characters can have the value '0' - '9'.

A value 10 therefore consists of two characters with the value 0x31 ('1') and 0x30 ('0').

9.3 Command Table

CMD	LEN	Value	Discription
0x41 (‚A')	‚5'	‚0'	Debug-Output disable
0x41 (‚A')	‚5'	‚1'	Debug-Output enable
0x42 (‚B')	‚5'	‚1'	Set default parameter
0x43 (‚C')	‚5'	‚0'…'5'	Volume repetition

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9.4 RemoteDialConfig

RemoteDialConfig is a simple and easy Config App for the RemoteDial.

RemoteDialConfig run on every Windows 10 PC with .NET Framework 4.8 installed.

1. Start RemoteDialConfig
2. Set COM Port from USB-Serial adapter (see Windows Device Manager)
3. Click Connect Button
4. Power off the RemoteDial, Push Rotary encoder switch to deload the capacitors
5. Power on
6. The interface is active for 10 seconds after Power ON (after receive data, the timer starts again)
7. After switching on the control, the controller sends the following information data
8. Click Command Button to transmit data
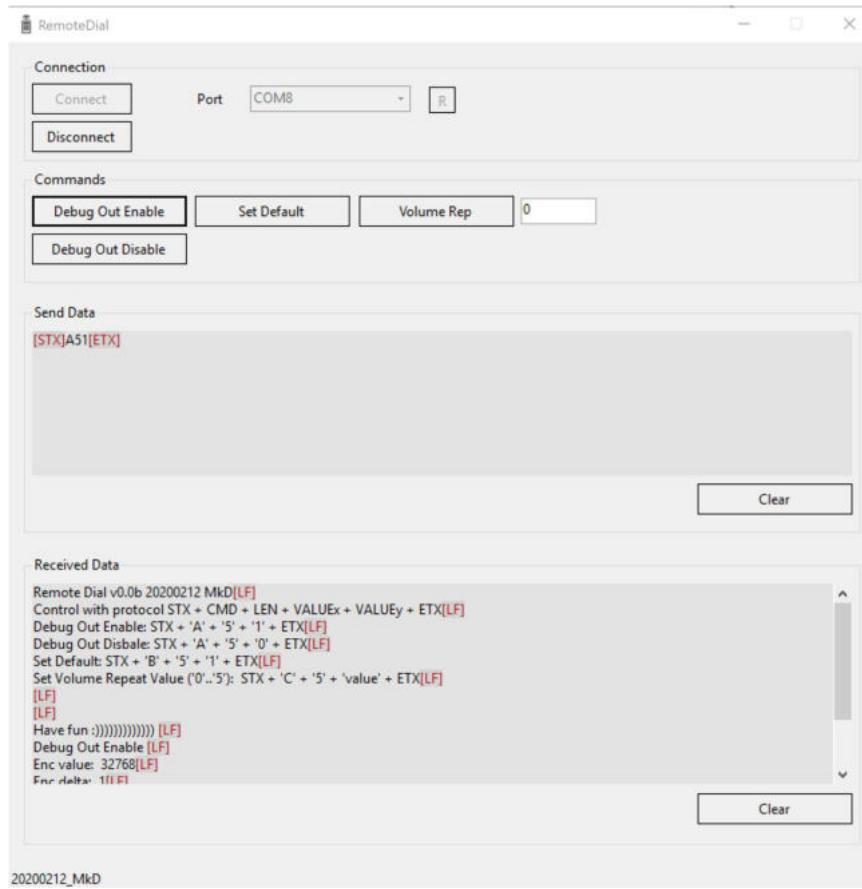
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9.5 Example with HTerm

1. Start HTerm (http://www.der-hammer.info/pages/terminal.html)
2. Set COM Port from USB-Serial adapter (see Windows Device Manager)
3. Set Interface parameter („Baud", "Data", "Stop", „Parity"), and „Send on enter" and „Type"
4. Click Connect Button
5. Power off the RemoteDial, Push Rotary encoder Switch to deload the capacitors
6. Power on
7. The interface is active for 10 seconds after Power ON (after receive data, the timer starts again)
8. After switching on the control, the controller sends the following information data
9. Send command from command table (example: STX B51 ETX to set default parameter)
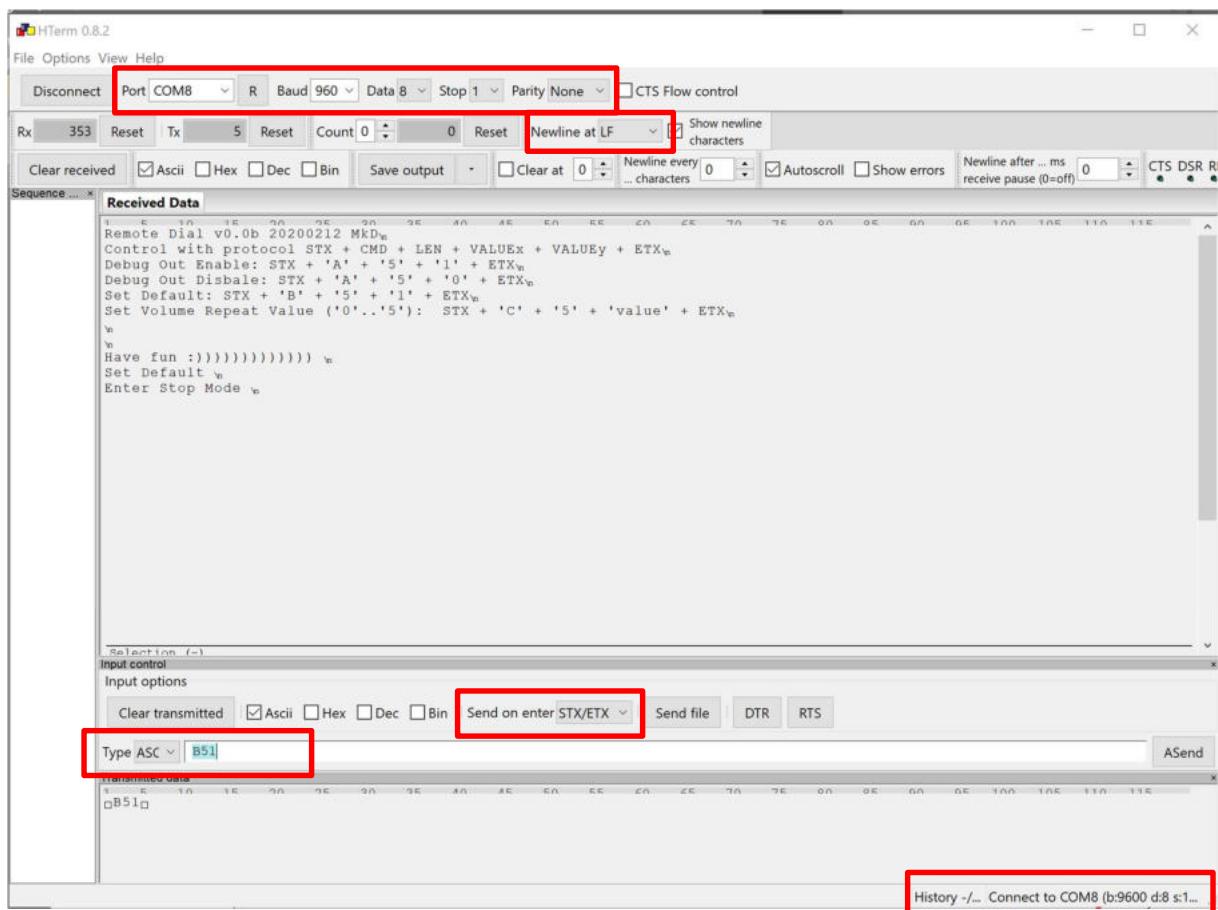
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10. Compatibility

10.1   Supported Remote Codes

Protocol	Manufacturer	Comment
RC5	Grundig, Marantz, Phillips	
RC6	Grundig, Marantz, Phillips	
NEC16/42	NEC, Yamaha, Canon, Tevion, Harman/Kardon, Hitachi, JVC, Pioneer, Toshiba, Orion, viele other japaniese manufacturer	
Apple	Apple	
Sony SIRCS	Sony	
Kaseikyo	Technics, Panasonic, Denon	

10.2   Proven Equipment

Devices that have already been tested are listed below, sorted by compatible or incompatible. This list is constantly being expanded.

10.2.1   Compatible Devices

Manufacturer	Model	Comment
Akustik Perfekt	Concerto CD1	CD-Player
Apple TV (3. Generation)	A1469	Set Top Box
Elgato	eyeTV hybrid	USB TV Card
Elgato	eyeTV	USB TV Card
Harman Kardon	AVR507	AV Receiver
Harman/Kardon	HK 630	Vollverstärker
NAD	C658	Streaming PreAmp, Set Volume Repeat = 2
Panasonic	TH-42PZ700E	TV
Phillips	49PUS7181/12	TV
SXONO		Phono Pre
Telefunken	L55F243R3C	TV
XLINE PRE		Pre Amp

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10.2.2   Incompatible Devices

Manufacturer	Model	Comment
Entertain/Magenta TV	MR401	Set Top Box
Entertain/Magenta TV	MR201	Set Top Box